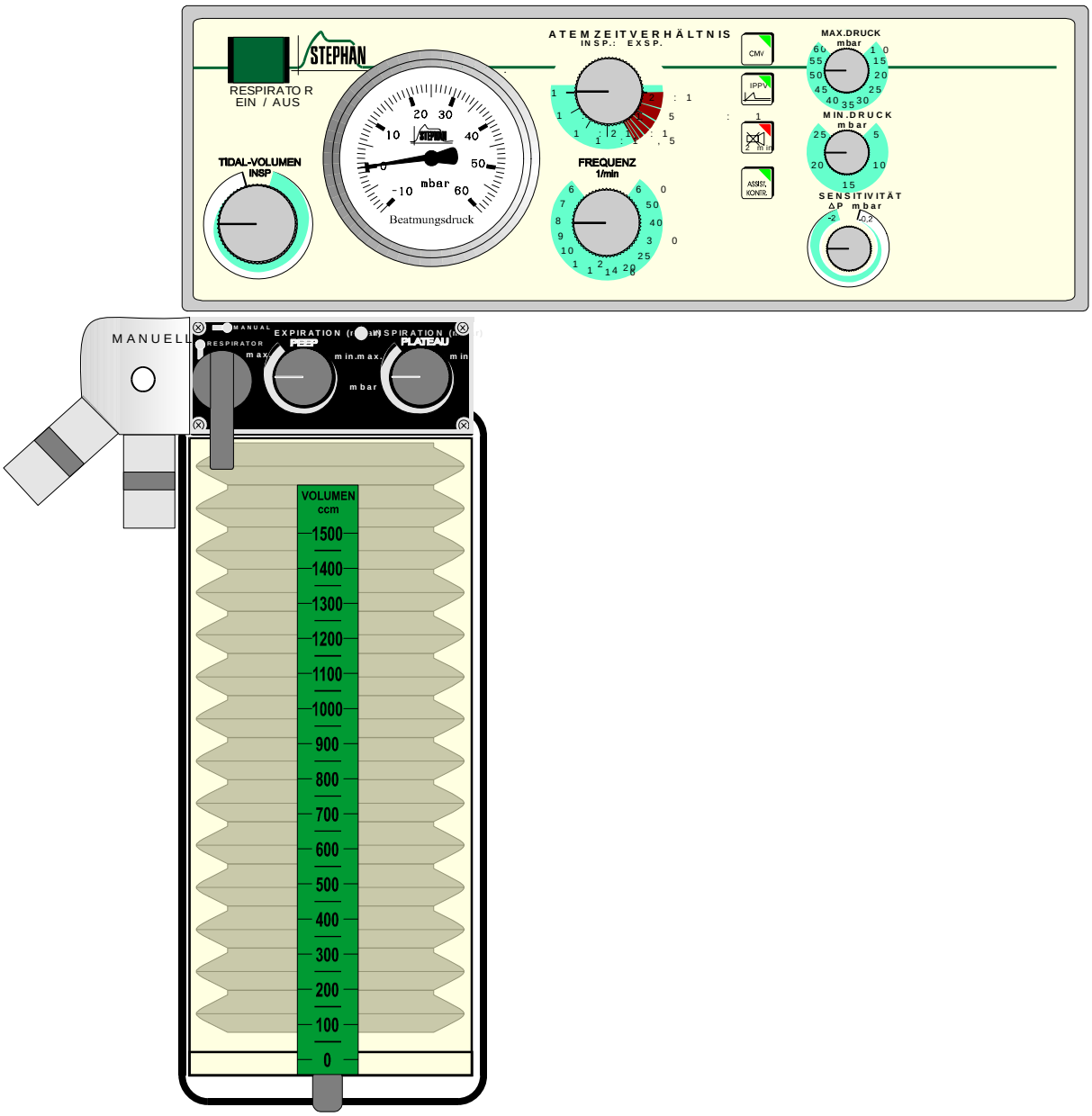
Ventilator ABV – A - U



Service Manual

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1. Description of construction and function

1.1 Complete scheme

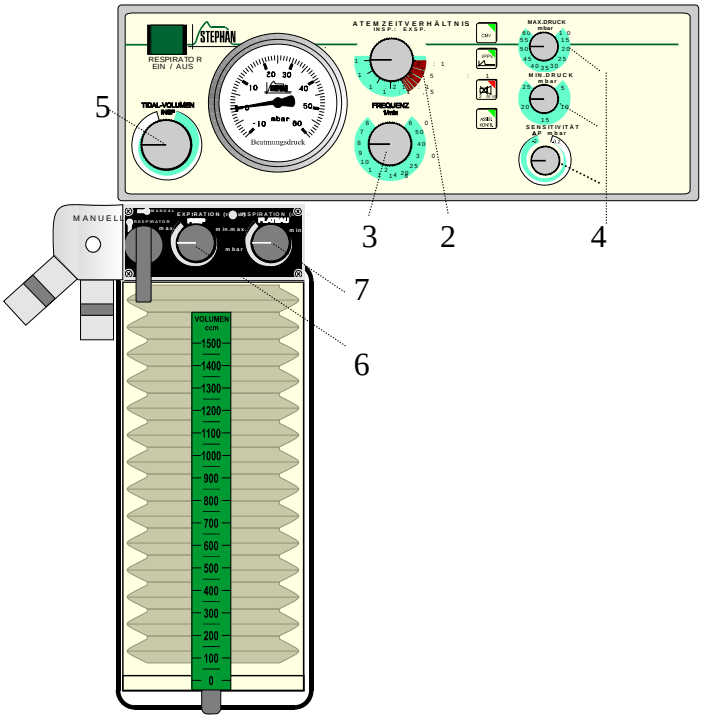
The respirator module is equipped with a pneumatic and with an electronic control unit (respirator ABV-A and patient unit), and with an electronic control monitor for breathing pressure.

The electronic of the respirator module is supplied with line voltage (230V/50 c.p.s.), while the pneumatic unit requires a propellant gas in form of compressed air (3 - 5 bar). The respirator ABV-A is designed for the anaesthesia respiration of children and adults in a semi-closed system.

The patient unit can be exchanged quickly due to its quick-release fastener and meets the highest requirements for hygiene because of its easy dismountability (partly autoclavable with a temperature of up to 134°C).

General description

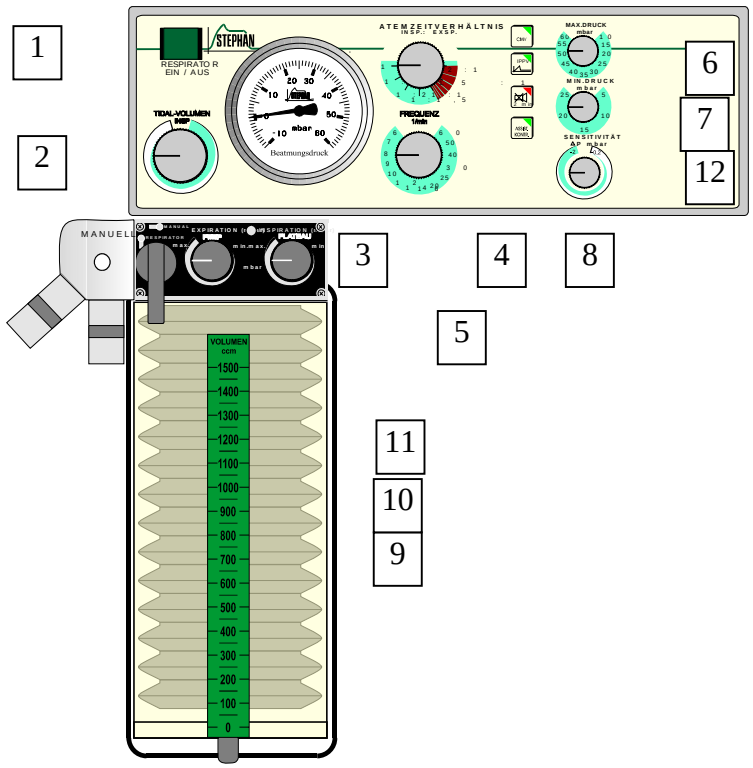
The respirator ABV-A has to be supplied with compressed air as propellant gas with a pressure of 3 - 5 bar (1). The various respiration parameters can be adjusted at the respirator:



- breathing/time ratio (2)
- frequency (3)
- Min. / Max. Pressure / Sensitivity(4)
- volume (5)
- PEEP (6)
- PLATEAU (7)

1.2 Respirator with patient unit

The respirator ABV-A is designed for controlled anaesthesia respiration with state-of-the-art technology.
The respirator works in a pressure-gas driven, timed and volume-constant way, with the possibility to limitate the inspiration pressure at the patient unit.
The patient unit is designed according to the "bag-in-bottle-principle", thus achieving a separation of breathing gas and control gas. In addition, the patient unit serves as reservoir.



On the upper left side of the respirator You find the ON/OFF-switch (1).
Directly below You find the flow-control valve (2), where the volume flowing to the patient's lungs during inspiration can be dosified.
The number of respiration cycles can be varied from 6 to 60 breaths per minute at the potentiometer "frequency"(3), while the ratio of inspiration and expiration can be preselected from 1 : 4 to 2 : 1 with the switch "breathing/time ratio"(4).
An excess-pressure proof respiration manometer (5) indicates the pressure in the system within a range from -10 - 60 millibar. The patient pressure can be controlled by setting of pressure alarm limits . Max.-pressure (6) and min.- pressure (7) can be varied with potentiometers. In the case of exceeding the alarmlimits an optical and visual (8) alarm is released.
In the event of a power outage, an acoustic signal sets off a warning for at least 30 sec. With the change lever (9) of the patient unit, either respirator respiration or manual respiration can be selected.
The PEEP-valve (10) serves to increase the pressure at the end of expiration to a maximum of 10 millibar. With the use of the plateau valve (11), You achieve a respiration with a constant upper pressure limited to a maximum of 60 millibar.

Only ABV-U

The respirator ABV-U can support spontaneouse ventilation of a patient. For that reasons is an additional membran key („assist.-control“) on the frontplate. The trigger sensitivity can be adjusted with the potentiometer „Sensitivity“ (12).

1.3 Adjustment of parameters at the respirator

1.3.1 Change of inspiration flow at the flow-control valve

In principle, it is possible to vary the inspiration flow at the flow-control valve in order to reach a tidal volume of 0 - 1500 ml. In relation with the plateau pressure however, certain respiration curves can be generated.

1.3.2 Frequency adjustment

The frequency (breaths per minute) can be adjusted for values between 6 and 60 breaths per minute.
When adjusting the frequency, take into account, that with an increased frequency the breath minute-volume remains constant, but that the tidal volume will be reduced.

1.3.3 Breathing/time ratio (inspiration/expiration)

The breathing/time ratio, the ratio of inspiration and expiration, can be preselected from 1 : 4 to 2 : 1 as the case might require, without influencing the respiration frequency.

1.3.4 Pressure monitor

The pressure monitor is an electronic module separated in two pressure-measurement ranges, for the continuous control of the pressure the patient is subject to. The patientpressure is also shown on the pressuregauge in the frontpanel of the ventilator.

Maximum pressure

The pressure-measurement range for the maximum pressure has a potentiometer which is to be used to smoothly adjust the upper respiration-pressure limit for values between 6 and 60 millibar.
In the event, that the pressure for the patient exceeds the adjusted maximum pressure, the pressure monitor sets off an optical and acoustic alarm until this pressure is no longer exceeded.

Minimum pressure- or disconnection unit

The pressure-measurement range for the minimum pressure has a potentiometer, which is to be used to smoothly adjust the minimum respiration-pressure limit-value for values between 5 and 25 millibar.
During one respiration cycle, the adjusted minimum-pressure limit-value has to be exceeded once and fallen short of once, if this is not the case, an optical and acoustic alarm is set off.

Flashing red: minimum-limit pressure-value permanently exceeded (Stenosis or PEEP to high), or value permanently not reached (disconnection).
In the event of an existing disconnection inside the system followed by a considerable pressure drop, the disconnection warning is set off with a delay of 15 seconds.

By pressing the STAND-BY foil button of the pressure monitor, the acoustic alarm can be suppressed for 2 minutes.
The pressure monitor is to be set in operation with the operating switch of the respirator.
In case of an artificial respiration without the respirator, the pressure monitor is not working.

1.3.5 Control limit-value IPPB

As an option, with this respirator model a pressure-controlled respiration (IPPB) can be carried out. For this kind of artificial respiration, expiration is induced when a preselected maximum pressure is reached.
For this purpose, the excess-pressure limit value of the integrated pressure monitor serves as pressure control.
The next inspiration cycle then will be set off by the time determined by the frequency.

Respirator "ABV-U"

In order to be able to work more successful in cases where the spontaneous respiration of the patient has not yet failed completely or is showing signs of coming back, we offer a "ABV-U" put-in respirator with integrated pressure monitor for assisted/controlled or pressure-controlled respiration.
Caused by the inspiration efforts of the patient, a below atmospheric pressure is generated inside the system, causing the respirator to carry out an additional and completely controlled respiration lift in accordance with the preselected respiration parameters.
In the event, that the spontaneous respiration of the patient ceases completely, the respiration frequency will be reduced to the preselected values and controlled respiration will be continued automatically.
The suction, that has to be generated by the patient to trigger respiration in this mode, can be varied with a sensitivity of 0.2 - 2 millibar of pressure difference at the adjusting knob for sensitivity.
In the event, that the respirator is operated with a positive pressure at the end of expiration, the trigger level is adapted to this value automatically.

1.4 Patient component ABV-A

1.4.1 PEEP-adjustment

The so-called "positive end expiratory pressure" is to be adjusted with the left control of the patient unit.
The reason for this increase of the pressure curve during expiration is to prevent the collapse of alveoli, or even to inflate collapsed alveoli again in order to make their participation in the gas exchange possible.
This PEEP is smoothly adjustable from 0 to 10 millibar, existing however a certain dependence from the fresh-gas flow, which has to be taken into account for the adjustment.

1.4.2 PLATEAU adjustment

The maximum inspiration pressure is to be adjusted at the right control of the patient unit.
The purpose of this so-called plateau is to keep the breathed gas inside the lungs for a short moment and at a constant pressure, in order to improve the alveolar gas exchange.
In addition, the plateau can be used as upper pressure-limit value or as a security device against excess pressure.
The plateau value can be varied within a range from 10 to 60 millibar.
The plateau is only to be regarded as a pressure limitation and is not meant to be regarded as part of a pressure-controlled respirator.

1.4.3 Change lever Respirator / manual

If a electrical power failure occurs , you can switch over to manual ventilation by moving the handle at the left side of the patient-unit from „Respirator“ to „manual“. A rebreathing-bag has to be connected at the outlet „Handbeatmung / manual“ of the patient-unit and the excess-valve at the circle-system has to be adjusted to the max. patient-pressure.

1.4.4 Ejektor / GAS EVAC

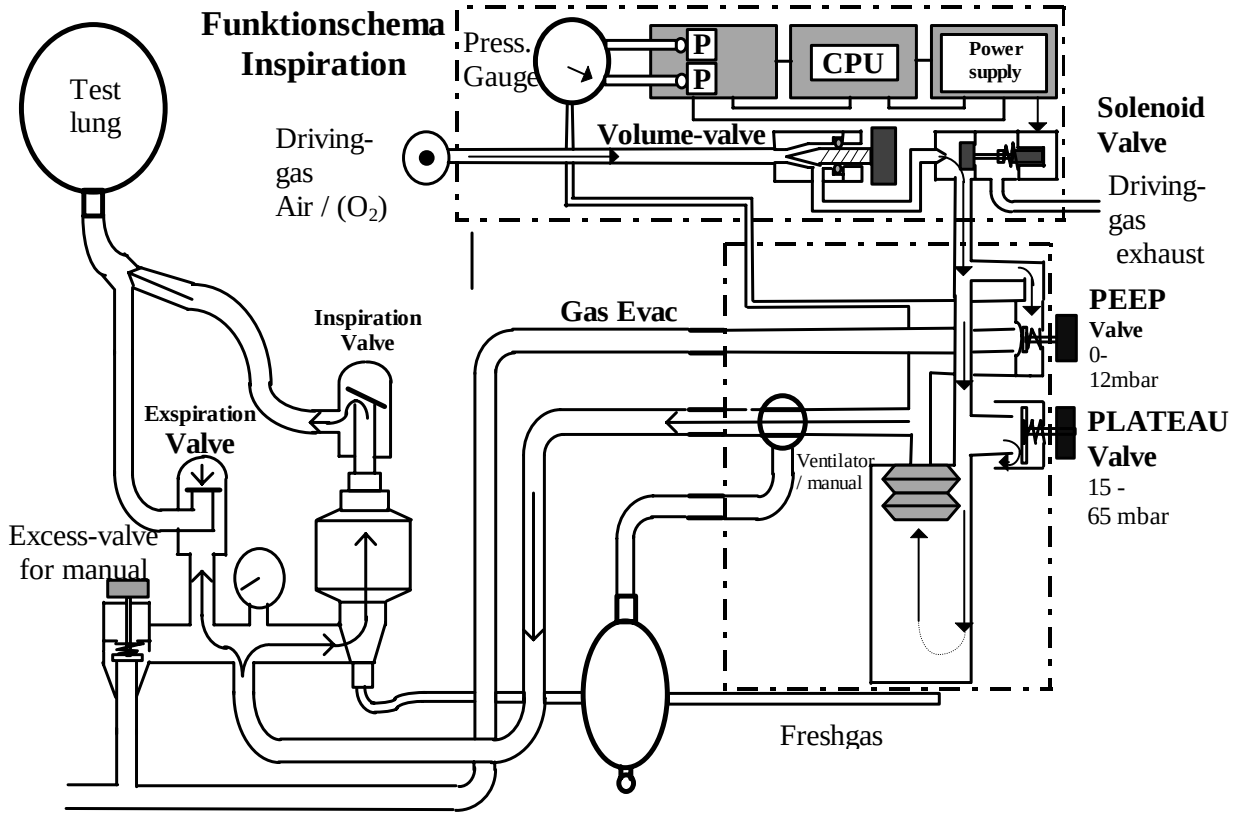
To evacuate the excess gas a tube can be connected at the outlet GAS EVAC .The connector is a Iso-cone of 30 mm.

1.5 Patient unit for paediatric respiration

In order to allow the use of the anaesthesia apparatus for paediatric respiration without having to carry out greater modifications, we designed a special plexiglass dome with an inner tube.
A rubber bellows developed for the artificial respiration of children is to be introduced in this inner tube.
This plexiglass dome with rubber bellows can be exchanged easily in next to no time. The volume of this paediatric system can be varied from 0 to 400 ml.

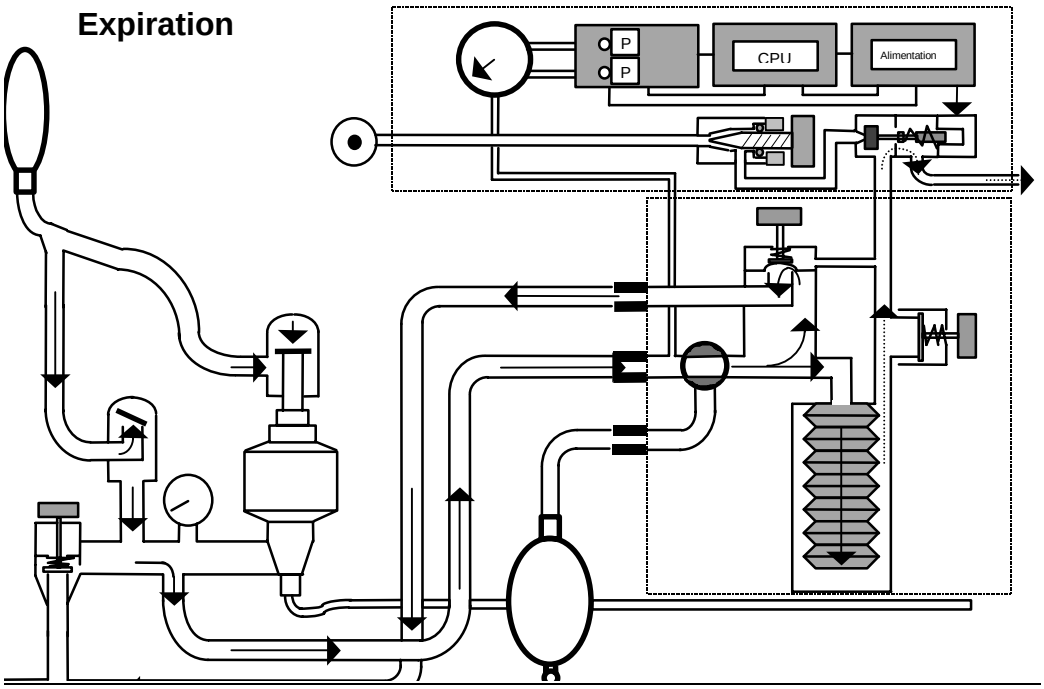
2. Function scheme

2.1 Technical course of events during inspiration



At the beginning of inspiration, the solenoid valve of the respirator opens and remains open during the period of time, that has been preselected for inspiration.
In the patient unit , the system is made tight with respect to the ejector and the surrounding area by pressure applied to the PEEP-diaphragm, and the pressure is limited at the plateau valve.
The pressure built-up in the plexiglass dome presses the fresh gas and the breathing gas for the patient out of the bellows, thus bringing it to the patient.
The respiration pressure, that is building up, can be read simultaneously from the manometers of the respirator and the circular system .
In the event, that the respiration pressure reaches the adjusted plateau pressure limit before the time for inspiration is over, the plateau valve opens and propellant gas is emitted to the surrounding area. A continuous control of pressures during inspiration is guaranteed by the pressure monitor . In the event of exceeding a preselected pressure limit, an optical and acoustic alarm is set off .

2.2 Technical course of events during expiration

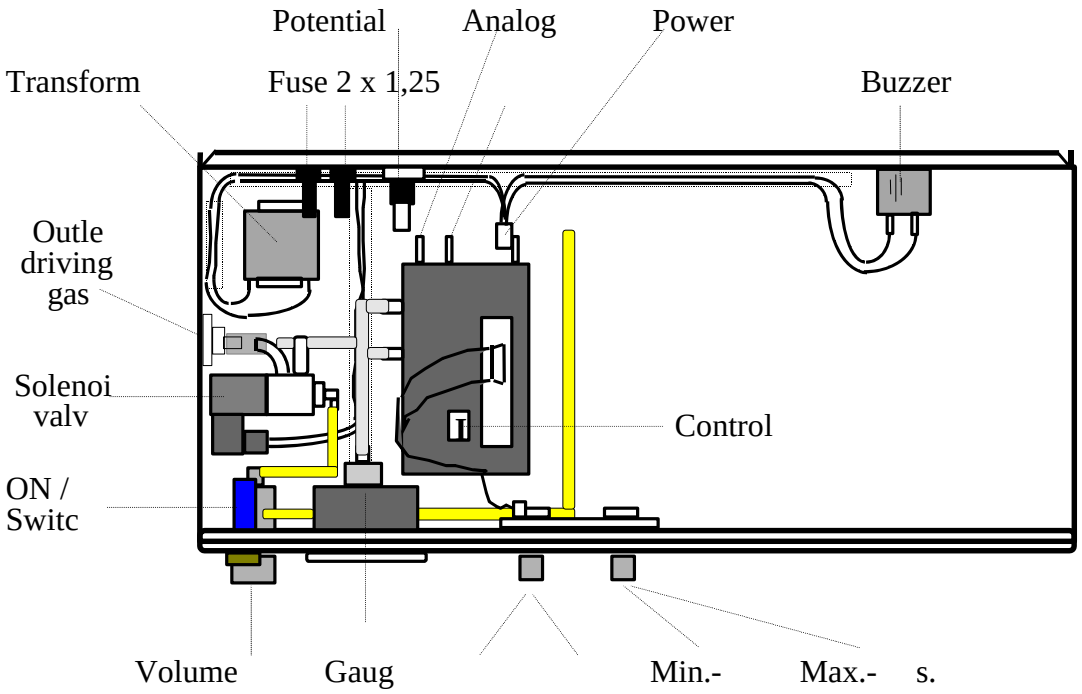


When the selected inspiration time is over, the solenoid valve cuts the gas supply and opens the system towards the surrounding area.
The excess pressure in the lungs of the patient closes the inspiration valve and opens the expiration valve . The patient breathes through the expiration valve into the inflating bellows, which is pressed down.
The superfluous consumed breathing air is conducted through the diaphragm of the PEEP-valve to the anaesthesia gas extraction. During this process, the diaphragm keeps up as much pressure in the system, as is determined by the adjusted PEEP-value .
The reduction of the respiration pressure and the remaining pressure at the end of expiration are displayed by the manometer of the circular system and that of the respirator .

By switching to hand/respirator , the manual respiration bag is directly connected with the system, thus allowing manual artificial respiration.

Note : If switched over to manual respiration , the PLATEAU valve is out of function and the excess valve has to be opened to control the max. pressure of the patient .

3. Servicing of basic apparatus



3.1 Electronic

The electronic of the ABV-A is according to the different tasks divided in 4 printed circuits , connected via a SPI - Bus or wire.

The circuits are :

1. Users circuit	- Frequency adjustment
	- RATIO Adjustment
	- Min. / Max. - Pres.limits
	- switches for CMV / IPPV , audible alarm mute
	- visual Alarms
2. Analogue circuit	- converting of analog signals
	- valve supporting IC`s
3. CPU	- steering and controlling of all functions
	- control display
	- watch dog
4. Power supply	- central-connecting of all wires
	- current and voltage supply

The electronics of the microprocessor-controlled respirator require no servicing. The control system runs through test programs at each putting into operation, which activate visual and audible alarm in case of malfunction.
In semi-annual cycles the apparatus has to undergo the following servicing, inspections and adjustments.

3.2 Pneumatic

Volume valve

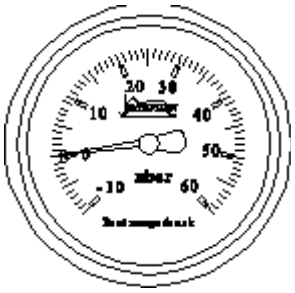
Check volume valve for leakage. If leakage occurs at the spindle change the inner O - rings (4 x 1,5 mm). Lubricate eventually using silicone grease .
The volume valve is adjusted so , that in the closed position a minimal volume (max. 100 ml) is given to the system to avoid incorrect adjustments.

Solenoid valve

Check solenoid valve for leakage while the volume valve is complete open and the ventilator is switched off . At the outlet of the solenoid valve should be no gas flow. If a leakage occurs , change solenoid valve.

Manometer

Check of respiratory pressure manometer for correct zero position (correction by means of a screwdriver, through the setting aperture in the Plexiglas cover).
Since a mechanic capsule-spring-manometer is used for gauging pressure, it must be checked whether the mechanic dial train is still working faultlessly. Otherwise the respiratory pressure manometer must be exchanged.



Patient unit connector

Check the O - Rings of the connection block for damages. Change O - Rings (10 x 2,5 mm) if necessary . Lubricate eventually using silicone grease .

4. Sight check

Inspection of apparatus for visible external damages.

5. Performance check

5.1 Self-test of respirator

Note : All following tests require the presence of a circle-system or narcotic-system (Magill ,Jackson-Rees , etc.) and a gas-mixing unit supporting the system with a freshgas - flow !

On the upper left side of the respirator You find the ON/OFF-switch .
Depressing it starts a test program with an automatic self-test, which checks all keys, switches and potentiometers. Furthermore the functioning of magnetic valve,pressure sensors and parts of the hard- and software and digital switching circuits is tested. If a fault is detected the respirator gives off an audible signal and switches itself off.
If a defect occurs, the display on the electronic block inside of the ventilator gives an information about the type of the defect.
To look onto the display you have to remove the cover.

5.2 Errorcodes / Operation - Display

The display shows the condition of the solenoid valve.

„ I “ = Inspiration
„ E „ = Expiration

Errorcodes
Different errorcodes can be generated on the display.

Reading „ 0 “ - Fault in the circuit of the potentiometers. Check connecting wires or poti .

Reading „ 1 “ - Fault in the circuit of the pressure sensors. Check tubes for leakage.

Reading „ 2 “ - Fault in the circuit of the solenoid valve . Check connecting wires .

Reading „ 3 “ - Power failure

5.3. Operating mode CMV

Check of the set respiratory frequency

The respirator is adjusted so, that no pressure alarms or stenosis alarms are released.
Respiratory frequency (BPM) is set at 6 min^{-1} and the respiratory time ratio I : E at 1 : 4. The values for inspiration time and expiration time must then be measured by hand (stopwatch). Frequency must be calculated accordingly. The calculated frequency must correspond with the set frequency. If this is not the case an error exists in the software of the respirator. In this case the manufacturer must be notified. All measured and calculated values must be registered in the test records.

Respiratory frequency = 60 sec / (inspiration time + expiration time)
allowed Tolerance = +/- 5 % or 3 BPM (what ever is bigger)

From the measured values for inspiration and expiration the set value of respiratory frequency must result by calculation.
Furthermore the set respiratory time ratio must result by calculation from the measured values for inspiration and expiration.

Respiratory time ratio = I : E = Insp.time / expir.time
allowed Tolerance = +/- 5 %

The calculatory check of respiratory frequency and respiratory time ratio must be repeated, in the same mode as described above, with the following settings:

Respiratory frequency = 12 l/min, I : E = 1 : 2
Respiratory frequency = 30 l/min, I : E = 1 : 1

5.4 Operating mode IPPV

With IPPV-ventilation it must be checked, whether a change-over from inspiration to expiration takes place, when the set maximum pressure is reached.
Set respiratory frequency at 6 l/min and the respiratory time ratio I : E at 1 : 4.
By means of the plateau valve on the patient component, plateau pressure is set higher than the maximum pressure value. When the respiratory pressure reaches the set maximum pressure value during inspiration time, the change-over to expiration must take place prematurely.

Note : In the IPPV - mode the time for inspiration can be shorter than adjusted because of the change-over to expiration when the set pressure is reached . Otherwise the time for expiration is as adjusted . The result is a increasing of the respiratory frequency taking into consideration the lost inspiratory time after change-over to expiration .

5.5 Pressure alarms

The respirator ABV-A is provided with devices for recognition of disconnection and stenosis.
The respiratory pressure is picked up in the expiration branch on the patient component. For this purpose a pressure-measuring tube in the respirator is connected with the patient component ABV-A via the gas connection nipple. This pressure measuring tube is conducted directly to the manometer. By the manometer the pressure measuring tube is connected with the two pressure sensors on the board.One sensor is only used to control the signal of the other sensor.With the help of the electronics of the board the analogous pressure signal is converted into digital signals and processed.
The software installed on the board of the processor evaluates these signals and checks them for validity and appropriate limit values.
The pressure alarm limit is set by means of the potentiometer for „ Max. Pressure“. If the measured pressure exceeds the set maximum pressure limit, an audible and visual alarm is immediately released.
The disconnection alarm limit is set by means of the potentiometer for „Min. Pressure“. If the measured pressure does not exceed the set minimum pressure limit, an audible and visual alarm is immediately released.
To test the correct performance of the pressure alarm the Y-piece must be connected to a test lung with the respirator switched on. Maximum pressure is set at 40 mbar, minimum pressure at 10 mbar and plateau pressure at 50 mbar (PEEP = 5 mbar). If the set maximum pressure limit is exceeded, an audible and visual alarm must be activated immediately and continue for duration of exceeding. When the measured pressure falls below the set pressure audible and visual alarm are cancelled.

Disconnectionalarm

To test the correct performance of the disconnection alarm the corrugated tube of the narcotic-system has to be pulled off from the patient component with respirator switched on, so no more built-up of pressure can take place. Maximum pressure is set at 50 mbar, minimum pressure at 10 mbar and plateau pressure at 40 mbar (PEEP = 5 mbar). A disconnection alarm is released after a delay time (length of delay time depends on the set expiration time plus 15 sec.

e.g. BPM = 15 min^{-1} , I : E - Ratio = 1:1 ,

=> $T_{exp.}$ = 2 sec.
=> T_{delay} = 2s + 15s = 17s).

After slipping the corrugated tube back onto the patient component and according built-up of pressure in the patient tube system, the alarm must be automatically cancelled.

Stenosis alarm

A stenosis alarm is released, if after a delay time (length of delay time depends on the set expiration time plus 15 s. s.ab.) the respiratory pressure does not fall below the set minimum pressure limit.

To test the correct performance of the alarm, the PEEP-value, with the respirator switched on and the complete patient tube system connected, must be set higher than the minimum pressure-limit , so that the measured pressure does not fall below the minimum pressure-limit. After the delay time an audible and visual alarm is released. When the PEEP-value is reduced, so that the minimum
pressure limit is remaining under again, the stenosis alarm ceases.

Two-minute stand-by (muting of audible alarm)

Proceed as for disconnection alarm. Wait until disconnection alarm activates, depress stand-by key and measure duration of muting of audible alarm.

Failure-of-current-alarm

With the respirator switched on, pull mains plug from socket and so simulate a failure of current supply. Now an audible alarm must be activated.

6. Check of electrical safety (STK)

The three Parameter, resistance of protective conductor, resistance of insulation, compensating apparatus leakage current must be measured, using the test kit.
The maximum limit values are determined as follows:

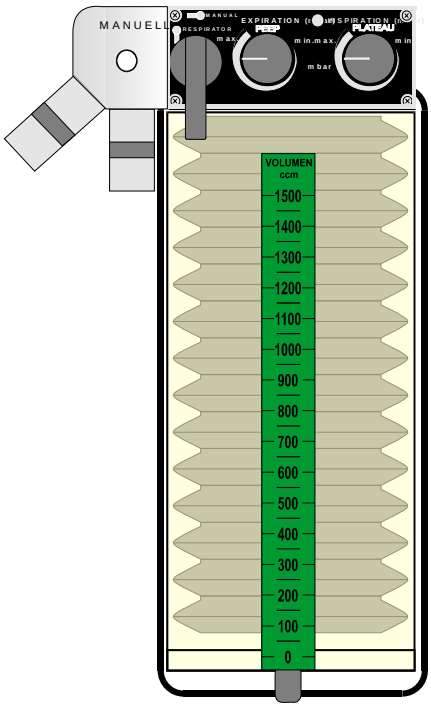
Resistance of protective conductor	< = 0,2 Ω
Resistance of insulation	> = 70 MΩ
Compensating apparatus leakage current	< = 1 mA

7. Patient unit ABV-A

With every semi-annual check, the O-rings of the gas-connection nipples on the connecting unit must be exchanged.

Furthermore the front panel of the patient component should be loosened and removed semi-annually. All removable accessible parts should be cleaned with alcohol.
We especially point out, that the inner part require intensive control and ,if necessary ,cleaning. In case of considerable wear (mechanical actuation) the PEEP-valve-disc must be exchanged.
The valve spindles must be tested for smooth working (lubricate eventually using silicone grease). The O-rings of the valve spindles (O-ring 12 x 1) must be checked for intactness and must be exchanged if necessary.
If this has been completed, put the front panel back on. In doing so, care has to be taken that the springs are placed correctly in the fairleads of the spring spindles.
Performance of the patient component must be tested prior to the final tightening of the front panel, an eventual slight adjustment of the front panel on the basic body may be necessary (align with the outer edge).

Finally the patient component attached to the respirator is operated with a flow of approximately 5 litres and with a narcotic- system with a testlung. Hereby the control knobs have to be checked and eventually readjusted.
The plateau-control knob has to be installed so that at its right-hand stop a pressure of 65 mbar is just reached.
The PEEP-control knob has to be installed so, that at its right-hand stop a pressure of 12 mbar is reached.



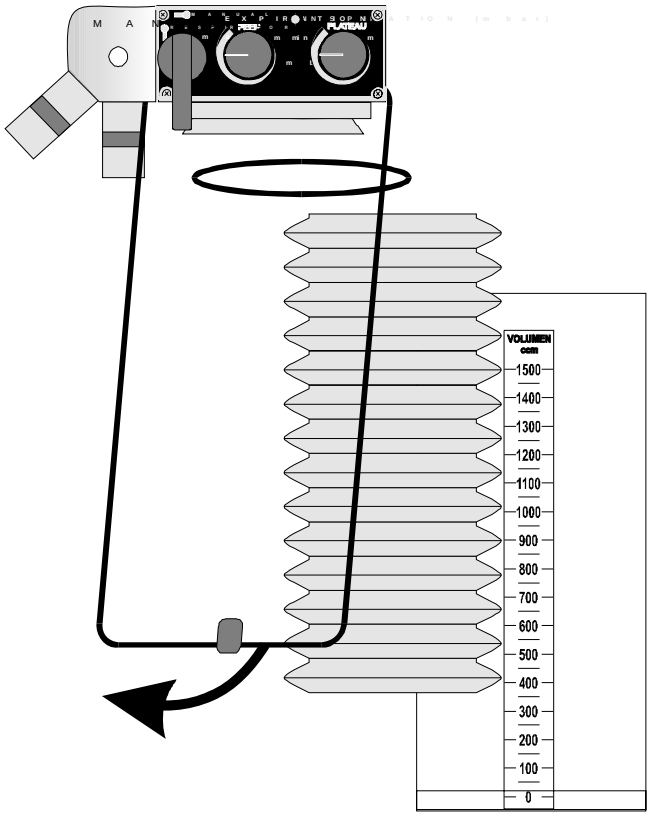
8. Cleaning & Sterilisation

8.1 Ventilator ABV-A

The ventilator can be cleaned using normal cold sterilisation solutions or soapy water.
Don`t use volatile solvents.

8.2 Patient unit

Disassembly



- Loosen knurled screw
- Pull off patient unit
- Pull clamp climp forward
- Take off plexiglass cylinder
- Pull off bellows and O-ring

All parts, except of the base part of the patient unit, should undergo a precleaning or a predesinfection, which is to be carried out as follows:

Put all parts (including rubber parts) in a disinfectant solution.
After the exposure time prescribed by the disinfectant manufacturer, thoroughly rinse all parts with water.
In order to avoid corrosion and the propagation of germs, it is recommendable to dry the parts.
Do not clean rubber parts with hard or sharp objects, in order to avoid damages.

Sterilisation

The rubber bellows (4) and the O-ring (3) have to undergo a superheated-steam sterilisation at 121°C (glove program).

The base part of the patient unit (2) and the clamp climp (6) have to be sterilised in the autoclave at 134°C.
The base part of the patient unit must not be cleaned with compressed air.

Assembly

Now that the parts are perfectly hygienic, reverse order of disassembly for assembly.

Before putting on the patient unit, lubricate the thread of the knurled screw (1) with a bit of grease.

9. Error-flow diagram

9.1 Respirator

Fault	Possible cause	Remedy
respirator without respiration pressure	- volume valve closed	-open volume valve
"PEEP" to high	- PEEP-diaphragm sticks (caused by inadequate sterilisation, for example)	- clean PEEP-diaphragm
tidal volume of patient part differs extremely from that of the volumeter	-inspiration valve or expiration valve installed incorrectly (for example missing valve plate, result: inconstant volume)	control inspiration and expiration valve
difference 300 ml	- untightness in the circular system - excess valve not in position "CL"	- check for tightness - switch excess valve to position "CL"

9.2 Pressure monitor

Fault	Possible cause	Remedy
minimum-pressure alarm is set off	- preselected minimum pressure limit value to small - PEEP above minimum pressure limit value - disconnection at the anaesthesia apparatus (circular system) - changes of with respect to the patient (compliance, resistance, TUBUSLAGE)	- select minimum pressure limit value of more than 10 millibar - reduce PEEP or increase minimum pressure limit value - search disconnection and re-establish connection
excess-pressure alarm is set off	- pressure limit below PLATEAU-pressure - upper pressure limit value below top-pressure of respiration - change of TUBUSLAGE change with respect to the patient (stenosis)	reduce PLATEAU-pressure or increase pressure limit reduce respiration pressure or increase upper pressure limit

10. Specification sheet

10.1 Ventilator module ABV - A

Measurements:

Width:	530 mm
Height:	120 mm
Front-to-back size:	280 mm
Weight:	12 kg
Fuses:	2 x 1.25 A trg. 3 x 20 mm
Line voltage:	230 V / 50 c.p.s.
Absorption of power:	18 VA
Respiration frequency:	6 - 60 breaths per minute
Breathing/time ratio:	insp. : exp. from 1 : 4 to 2 : 1
Pneumatometer:	-10 - 60 millibar excess-pressure proof to 600 millibar
Power outage alarm:	acoustic for at least 30 sec.

Pressure monitor

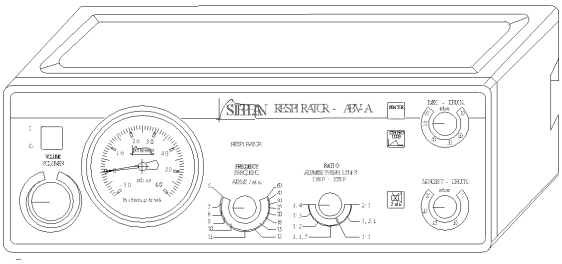
Measuring range:	0 - 60 millibar
Measuring accuracy:	+/- 1 %
Measuring principle:	piezoresistent pressure pick-up
Excess pressure alarm limit value adjustable:	from 5 - 60 millibar
Minimum pressure alarm limit value adjustable:	from 5 - 25 millibar
Alarm for - excess pressure:	LED, red , visual
- minimum pressure:	LED, flashing red , visual
- acoustic alarm:	electronic, can be suppressed for 2 minutes

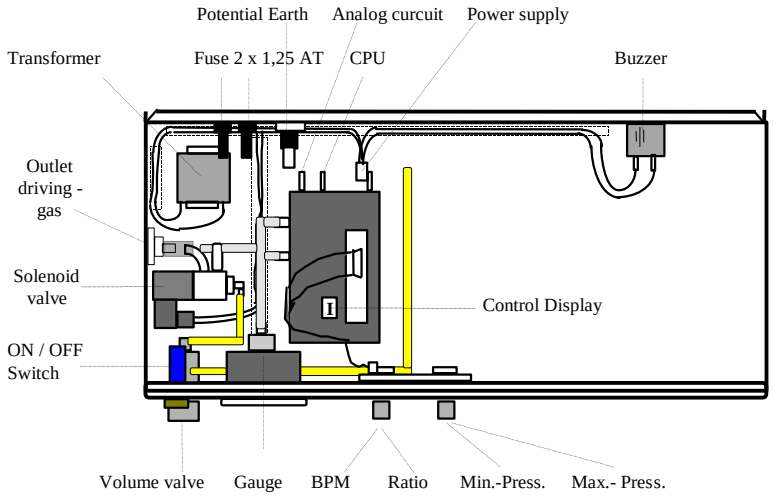
10.2 Patient component

Tidal-Volume:	0 - 1500 ml adult version of patient unit
	0 - 400 ml paediatric version of patient unit
PEEP-valve:	0 - 10 millibar
PLATEAU-valve: (upper pressure limitation)	10 - 60 millibar

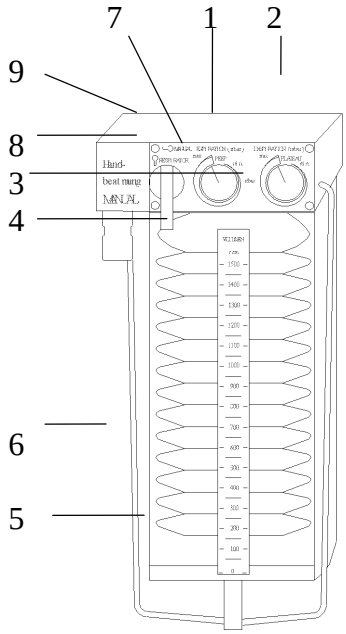
11. Spare - Part - List

Pos	Articleno.	Description
	115 61 000	Ventilator ABV - A
1	905 32 010	Cover V2A
2	923 60 002	Manometer -10 - 60 mbar
3	810 60 317	Trafo BV 4374
4	105 60 024	Buzzer
5	804 60 004	Fuse 1,25AT
6	804 60 001	Fuse holder
7	804 60 002	Fuse assembly
8	801 60 040	Potential earth connector
9	105 61 013	Solenoid valve
10	105 31 001	Volume valve
11	950 60 006	O - ring 10 x 2,5 mm
12	926 60 004	Turning knob 20 mm
13	926 60 006	Cover for knob 20mm
14	926 60 005	Arrow disk for knob 20 mm
15	926 60 001	Turningknob 28 mm
16	926 60 003	Cover for knob 28 mm
17	926 60 002	Arrow disk for knob 28 mm
18	810 60 530	On / Off switch
19	810 60 537	Lamp for switch





	153 61 000	Patient component ABV-A (Adult)
1	153 61 016	knurled screw
2	153 40 024	base part
3	950 60 022	O-ring , 105 x 3,5 mm
4	153 61 009	rubber bellows
5	153 61 014	plexiglas dome
6	153 40 032	fixing bracket
7	926 60 007	turning knob , black
8	153 42 022	switch lever
9	153 71 023	front plate , complete with accessoires



12. Maintenance

In accordance with the "Regulation of Security of Medical and Technical Equipment" (MedGV), medical/technical equipment has to undergo regular inspections.

Such an inspection has to be carried out exclusively by authorised persons (service personnel) of the supplier of the equipment.

Regular maintenance and inspection every six months.

You achieve the best guarantee by concluding a maintenance agreement, which includes regular inspections every six months with automatic replacement of parts with a risk of wear.

In the event, that maintenance is carried out by unauthorised personnel without the necessary expertise, the liability of the manufacturer for the secure function of the equipment ceases immediately.